

# INFORMATION TECHNOLOGY

## BEYOND SURFING: TOOLS AND TECHNIQUES FOR SEARCHING THE WEB

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THE WORLD WIDE WEB HAS EMERGED as a viable and legitimate way to publish information. Librarians are being asked by their patrons to help them find this information. Experience is starting to suggest that certain kinds of information can be found more effectively on the Web than it can be found using print sources.

Until recently, surfing was a typical approach for finding information on the Web. Surfing is unstructured and serendipitous browsing. Starting with a particular Web page, the approach is to follow links from page to page, make educated guesses along the way, hoping sooner or later to arrive at the desired piece of information. Surfing is fun when you have the time to explore, but when you have a patron standing by, or need to

find a specific piece of information quickly, or need to find that same information again, surfing and serendipity soon lose their charm. Surfing is browsing without tools.

A number of new tools have been developed that enable information published on the Web to be searched and discovered more effectively. This article focuses on some of the tools now available for finding information on the Web using two interdependent approaches: browsing through subject trees and hierarchies, and keyword searching using search engines. It is increasingly important for librarians to know when it is appropriate to turn to these tools, how to efficiently and effectively use them, how to select the best tool and approach for the task at hand, how to critically evaluate them, and in general, how to integrate these tools and approaches into everyday library work.

### Tools for browsing: subject trees and hierarchies

A subject tree is a tool that provides a structured and organized hierarchy of categories for browsing for information by subject. Under each category and/or sub-category, links to appropriate Web pages are listed. Web pages are assigned categories either by the Web page author or by subject tree administrators. Many subject trees also have their own keyword searchable indexes.

Well-known subject trees that present links with brief annotations include Yahoo, Galaxy, and the WWW Virtual Library. These subject tree sites are typically large with minimal restrictions as to what will be accepted for inclusion.

Other subject trees, such as GNN's Whole Internet Catalogue, Magellan, also known as McKinley's Internet Directory, and Point Communications provide significant added value to each link with commentaries and ratings provided by skilled reviewers.

Subject-specific guides that function as subject bibliographies to Internet resources are being authored by subject specialists. These subject guides, such as ArchNet, which serves as the WWW Virtual Library for Archaeology, are specialized subject trees for specific disciplines. The Clearinghouse for Subject-Oriented Internet Resource Guides is a tool that provides subject access to these subject guides.

Appendix One lists browsing tools that we have found to be useful for Internet resource discovery.

### Tools for keyword searching: search engines

Search engines feature indexes that are automatically compiled by computer programs, such as robots and spiders, that go out over the Internet to discover and collect Internet resources. Searchers can connect to a search engine site and enter keywords to query the index. Web pages and other Internet resources that satisfy the query are identified and listed.

Search engines vary according to the size of the index, the frequency of updating the index, the search options, the speed of returning a result set, the result set presentation, the relevancy of the items included in a result set, and the overall ease of use.

Well-known search engines include Webcrawler, Lycos, and InfoSeek. Search engines that are used to build subject-specific indexes, such as Harvest, are also available. SavvySearch and Meta-Crawler are multi-threaded search engines offering the opportunity to search several search engines simultaneously with a single query. In addition, there are sites featuring uniform forms-based interfaces to several search engines. The All-in-One Search Page and CUI's W3 Search Engine page are examples of this type of site.

Appendix Two lists keyword searching tools that we have found

to be useful for Internet resource discovery.

### **Evaluating these tools — why bother?**

The number of search tools is growing. No single search tool can be relied upon to satisfy every query. Until recently, the best search tools were available free of charge. The latest rave, InfoSeek, is configured on a fee-for-search basis. Magellan is now free, but the developers are clear that the intent is to make it available only through licensed Internet providers. Many other popular search tools have moved from the laboratories of computer scientists and are now affiliated with for-profit organizations. Yahoo, GNN's Whole Internet Catalogue, and Webcrawler have been acquired by America Online with the potential for future subscription requirements.

As these search tools become increasingly indispensable to libraries, librarians will need to be very discriminating as to which tools they will select and which tools they will pay to use. It is, therefore, appropriate for librarians to attempt to examine, compare and evaluate these tools.

Evaluation is an ongoing challenge. Not only is the rate of publishing expanding the indexes and subject hierarchies at an exponential rate, but enhancements and refinements to the search algorithms and the search interfaces change the performance of these tools from one day to the next. New alliances between organizations building and sponsoring these tools, such as Yahoo and OpenText, change the functionality and, thus, their effectiveness for finding information.

We have identified a number of recent studies that evaluate and compare some of the more well-known search tools that may be useful starting places for librarians as they determine the search tools most effective for their libraries.

These studies are listed in Appendix Three.

### **An early evaluation**

An early evaluation that we conducted to explore the question 'Is the Web Navigable?' looked at six of

these tools: Yahoo, Einet Galaxy (now called TradeWaves Galaxy), WWW Virtual Library, Webcrawler, WWW Worm and Lycos. Each search tool was tested with the same query, and the behaviour and performance of each was documented according to the following criteria: scope, the options for entering a search, the nature of result set display, and ultimately, the success of the search tool in satisfying the query. Our investigation concluded that, despite difficulties and shortcomings, these search tools were potentially effective compasses by which to navigate the Web. A detailed description of each of these six search tools, as of June 1995, was presented at the 1995 CLA annual conference. This presentation, entitled, *Tools and Techniques for Navigating the Web*, is available at: [http://burns.library.uvic.ca/KWM\\_Post\\_CLA.html](http://burns.library.uvic.ca/KWM_Post_CLA.html).

Our investigation turned out to be much more of an exploration than had been anticipated. We found ourselves in a world beyond Boolean and had to come to grips with information retrieval tools that also supported concept searching, fuzzy matching, and relevancy ranking. Deciphering the interface and help page jargon of the information scientists who had developed these tools was a constant challenge. A lasting benefit of this investigation, for us, has been the identification and development of some specific search techniques and strategies that still apply to these evolving search tools.

One of the keys to effective use of these WWW search tools is knowing what kinds of information is being published on the Web. Once the decision has been made to look to the Web for information, the next step is to determine whether to browse one of the subject trees, use a search engine, or use both of these approaches.

### **Searching considerations: browsing tools**

If the objective is to find what has been published on the Web on a broad topic, browsing a subject tree and following links related to the topic is often a good starting place. Subject trees ultimately function like subject catalogues. According to

recent evaluations and studies, Yahoo is the best subject tree to start with and the one we consistently have found to be both useful and fun.

The subject-oriented organization of these various subject trees, while logical, can make it difficult to second guess topics that are not easily categorized. The lack of a controlled vocabulary, within and between different subject trees, along with ad hoc additions of new categories, increases the difficulty of browsing subject trees effectively. In general, browsing subject trees can be a time-consuming activity. Those subject trees that can also be keyword-searched go a long way to relieve these problems.

Because subject trees rely on humans for their overall design and maintenance, they typically provide links to a smaller number of documents than most automated search engines. The results of browsing, or even searching an index to a subject tree, are likely to be incomplete. For these reasons, subject trees do not always do the job and it is usually advisable to supplement a subject tree search with a visit to one or more search engines.

### **Searching considerations: keyword searching tools**

Selecting the right search engine does not necessarily have to be a trial and error process. Connection difficulties, however, often make this choice for you. Lycos, one of the biggest and most popular search engines, is legendary for its unavailability during work hours. Webcrawler is more often available, and although considerably smaller, is easy to use, and as a consequence, is often the first choice. The new kid on the block, InfoSeek, has been favourably reviewed and rated number one in several recent studies. Two other new search engines, Excite and Inktomi, are also worth exploring.

The decision regarding the best search engine to start with depends partly upon a thorough understanding and knowledge of the elements in a document that have been indexed by each engine. For example, Webcrawler indexes every word of a Web page, while the Lycos index is built with only selected words, such

as the title, the headings, and the most significant 100 words. These differences contribute to the very different result sets that are returned by different search engines for the same query.

Not all search engines offer the same search options. Some of the engines use 'or' as the default and rely on relevancy ranking algorithms to find and rank relevant documents. Other search engines offer a choice between 'and', 'or', 'adjacent', 'near', and 'not' options. More sophisticated search engines, such as InfoSeek and OpenText, offer concept searching and phrase searching. The available search options are usually detailed in help pages associated with each search engine.

Precision continues to be a problem. The more sophisticated engines demonstrate better precision. Different search engines are better for some searches than others. For example, the lack of phrase or word adjacency capabilities with Webcrawler makes it an inappropriate tool for an author or name search. Such a search will typically retrieve a ranked result set, but as the first and last name have been considered to be separate and unrelated search terms, the chance of a successful outcome is very low.

On the other hand, Webcrawler's full page indexing can be very effective when one is looking for an obscure term. Precision can usually be improved by including more terms in the query. But too many terms can also backfire, so you have to be prepared to be persistent and creative.

The sophistication of search options is not the only factor to be considered in determining which engine to use. The size of the index is also a factor. For example, Lycos offers relatively simple search options, but because it indexes the largest number of Internet resources, it is often successful where others fail.

Each search engine varies significantly in the way the result sets are ranked and presented, and this can impact the success of a search. Scanning down a result set before activating any of the links is a recommended strategy. The highest ranked documents in the list are not

necessarily those that will provide the desired information. Often the best link is further down the ranked list. The amount of information provided with each link contributes to the ability to assess the individual links. Webcrawler, at one end of the spectrum, presents a ranked list of links with no additional information. At the other extreme, Lycos generates a lengthy computer-composed abstract for each link which is useful for evaluating links. OpenText is an example of a search engine that goes even further and suggests links to related sites.

These search engines, compared to OPACs and online periodical indexing tools, are still relatively limited in some respects. The ability to combine results sets and limit searches to specific fields has not been fully realized. These huge, automatically built indexes that rely on keyword searching and relevancy ranking pose new sets of information retrieval challenges for librarians.

#### **Reflecting on the implications for libraries**

During our CLA presentation in June 1995, we posed questions that are still valid for ongoing discussion. Where and how can we best integrate these tools into the library? Can they be used effectively, efficiently and reliably as reference tools? Should our bibliographic instruction sessions focus on these tools? Can the evaluation criteria we use for traditional reference works and finding aids be applied to these tools? Can we rely on search engines and subject trees only for Internet information resource discovery, or should we be cataloguing Internet resources for entry into our online catalogues? Should we be building subject guides to Internet resources for our patrons? Are these tools becoming so essential that we would be willing to pay to use them? How can librarians become more involved in search engine and subject tree design? Is it important to take the time to learn and think about these tools so that we can address these questions?

Meanwhile, the world of search engines and subject trees is moving along. Many libraries are already responding to the growth of

publishing on the Web and are exploring solutions to help their patrons discover and access this information. Libraries are building Web pages that feature access to these search engines and subject trees. Librarians are beginning to rely on these search tools. Commercialization of these search tools will guarantee financing for enhancements that will result in better interfaces, more sophisticated search options and more precise result sets. These tools can only get better. The better they get, the less likely they will be freely available. Competition and the price tag will justify more rigorous evaluations and comparisons.

It is our perspective that librarians need to quickly develop an expertise in the use of these search tools. It is also our perspective that librarians have a role in participating in the design and evaluation of these tools. There is already so much valuable and useful information on the Web that librarians need to be able to exploit these tools to their fullest potential to successfully discover and access this information.

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## APPENDIX 1

### BROWSING TOOLS: SUBJECT TREES, REVIEW SITES AND SUBJECT GUIDES

*Arrangements by topic or broad subject category*

- **Canadian Information By Subject**

<http://www.nlc-bnc.ca/caninfo/ecaninfo.htm>

The National Library of Canada has embarked on a project to provide a subject arrangement of links to information about Canada from Internet servers around the world. Until the comprehensive subject arrangement has been developed, a high quality list of sites has been listed.

- **Galaxy (formerly EInet Galaxy)**

<http://galaxy.Einet.net/galaxy.html>

One of the first browsing tools available and one of the largest. A well organized and easy-to-browse topical arrangement to a wide variety of Internet resources. Provided as a public service by TradeWave and 25 volunteer guest editors (real human editors). A useful new search engine interface (WebSearch) offers easy searching of the selected indexes: Galaxy pages (full text, title only or links only), Gopher titles, and Telnet sites. Connection problems due to its popularity.

- **Internet Public Library**

<http://ipl.sils.umich.edu/>

A must-visit service offered by the University of Michigan with attractive black-and-white graphical interfaces that will particularly appeal to students of all ages. The Reference Center, with the ability to query the on-duty desk librarian, is a particularly interesting place to visit and browse around. The Ready Reference Collection contains links with descriptive annotations for selected Internet sources. Ready Reference is also keyword searchable.

- **Internet Sleuth**

<http://www.intbc.com/sleuth/sleuth.html> (non-Netscape users)

<http://www.intbc.com/sleuth/> (Netscape users)

Often considered to be only a search engine, but it is also a unique browsing tool that offers an ability to browse the Sleuth by category. When a category is selected, a forms interface is presented listing searchable databases for the chosen category. Internet Sleuth thus provides a shortcut to more than 750 searchable databases. Annotations briefly indicate the scope of the individual databases.

- **Maple Square: A Canadian Catalogue**

<http://www.canadas.net/Maple-Square/>

A new Canadian site offered by Praesentia Internet Inc. offering a browsing and search capability. Maple Square is requesting submissions. A demo version only was available by press time.

- **Planet Earth**

[http://www.nosc.mil/planet\\_earth/info\\_modern.html](http://www.nosc.mil/planet_earth/info_modern.html) (text version)

[http://www.nosc.mil/planet\\_earth/everything.html](http://www.nosc.mil/planet_earth/everything.html) (comprehensive image map)

A text version and an image map version are available for this extensive virtual library. The graphic version is slow

to load, but should be visited at least once to get an overview of the wealth of information and services that are offered. The text version is a well-organized compilation of links to almost anything. A good search capability complements browsing. Created and maintained by physicist Richard P. Bocker, of San Diego, California.

- **Scott Yanoff's Internet Services list**

<http://www.uum.edu/Mirror/inet.services.html>

A Top 5 Per Cent of the Web Award winner. One of the earliest subject arrangements to Internet resources, and with four years of links and still going strong, it is still worth visiting. It is not as comprehensive as Yahoo, but provides access to ftp and telnet sites, as well as WWW pages, and includes login and passwords where appropriate with some brief descriptions of some of the listed ftp sites.

- **WWW Virtual Library (from W3C — The WWW Consortium)**

<http://www.w3.org/hypertext/DataSources/bySubject/Overview.html>

A GNN Best of The Net nominee. A distributed subject catalogue that is built and maintained collaboratively. It is made up of more than 50 subject indexes that are located at sites distributed around the world. (See *ArchNet* below.) It offers a Category Subtree, Library of Congress Classification (experimental), Top Ten Most Popular Fields (experimental), and Statistics (experimental). CUI (<http://cuiwww.unige.ch/w3catalog>) provides a searchable centralized index for the servers participating in the WWW Virtual Library.

- **WebSurfer (from World Access Internet Navigator)**

<http://www.infohiway.com/way>

Called a 'Surf engine' that has been designed for browsing. Topical access to 50,000 Web pages. Access is achieved by selecting the first letter of the topic word, then the first and second letter combination of the topic word. Within these groupings, full word topics are listed that link to alpha list of the Web page names. The hierarchy is computer generated by alpha sorting keywords from the Web page name, city, country, and a site description. It works. The hierarchy is also searchable. Commercial site. No fee yet.

- **Yahoo**

<http://www.yahoo.com>

A GNN Best of the Net nominee. The best known and most popular subject tree. Tens of thousands of Internet sites are listed within an easy-to-use, comprehensive subject hierarchy. The lists feature short descriptions of the sites. Sometimes links are out of date, but this is still one of the best places to start a search. Browsing can be facilitated by keyword searching the Yahoo hierarchy. Yahoo also features a What's New, and What's Cool service. Recently acquired by America Online.

### *Geographical arrangements*

- **CityNet** (from **Excite**)

<http://www.city.net/>

Browse by country, province/region, city/community for general information, tourist guides, and pictures for thousands of places. Updated daily with travel, entertainment, local business, government and community services information for all regions of the world.

- **Virtual Tourist2**

<http://wings.buffalo.edu/world/vt2/> <http://wings.buffalo.edu/world/vt2>

A map-based graphical interface to CityNet.

- **GeoSurfer** (from **World Access Internet Navigator**)

<http://www.infohiway.com/way>

Called a 'surf engine' that has been designed for browsing. Geographical access to 50,000 Web pages with links arranged first by continent, then by country. Within a country, city and/or region, access is achieved by selecting the first letter of the name and then scanning an alpha list of links. Hierarchy is computer generated by alpha sorting keywords from the Web page name, city, country, and a site description. It works. The hierarchy is also searchable. Commercial site. No fee yet.

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### *Reviewing sites featuring a subject arrangement*

- **NetReviews** (from **Excite**)

<http://www.excite.com/Subject/>

Web sites and Usenet sites are hierarchically arranged within 14 broad categories, each sub-categorized and designed to support informed browsing. Informative reviews and all terms in the subject hierarchy are created and maintained by professional journalists (30 of them). A companion to the Excite search engine (Architext Software).

- **Magellan: McKinley's Internet Directory**

<http://www.mckinley.com>

New in August 1995. A subject-arranged resource directory of 80,000 Web sites that is maintained by a group of international publishers, technologists and 'high level' information specialists offering star ratings and brief descriptions for 20,000 Web sites. A search engine facilitates browsing. Described by GNN as 'one of the premier resource directories on the Web.' Currently available at no cost, but this reference service will soon only be available through licensed Internet access providers, such as IBM and Netcom.

- **Point Communications/The best sites of the Web**

<http://www.pointcom.com>

A Best of the Web site. Reviews and separate ratings are presented for content, presentation and experience, using a scale of one to 50, for all sites in the collection. The arrangement by 10 broad subject areas, with further

sub-categories, facilitates identification of the best Web resources by subject. Text, GIF and JPEG versions are available. Designed as a reviewing site so links under a category lead to individual reviews and then to the Web site, so not to be used as a high-speed browsing tool. (Point Communications Corporation)

- **WIC** {select} from **GNN** (prior to October 1995, known as the **Whole Internet Catalog**)

WIC-Select homepage: <http://www-e1c.gnn.com/gnn/wic/wics/index.html>

WIC-Select topics list: <http://www-e1c.gnn.com/gnn/wic/wics/alltop.toc.html>

GNN homepage: <http://nearnet.gnn.com/gnn/GNN/home.html>

GNN sponsors the Best of the Net Awards. WIC Select, a hand-picked, subject-categorized, annotated collection of 2,000 of the best free Web sites is one of many GNN specialized databases. Recently acquired by America Online to complement AOL's suite of Internet access services that include Yahoo and Webcrawler.

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### *Specialized subject guides featuring a subject tree approach*

- **ArchNet World Wide Web Virtual Library**

<http://spirit.lib.uconn.edu/archaeology.html>

An example of a subject-specific guide to Internet resources that provides a topical arrangement to information published on the Web for that discipline. Two browsing options are available: by geographic region and by subject. Features text and graphical hierarchies. ArchNet serves as the World Wide Web Virtual Library for Archaeology. The Web pages are served and maintained at the University of Connecticut, consistent with the distributed approach of the WWW Virtual Library.

- **Welcome to Bill's World**

<http://www.io.org/~jgcom/Overview.html>

A KWM personal favourite. A Toronto lawyer by day and a Web surfer every other waking minute (and a self-confessed insomniac) has built this amazing personal library to Web pages across all subject areas with a special concentration in Links to Aboriginal Resources and a Web-based Law Library.

- **Clearinghouse for Subject-Oriented Internet Resource Guides**

<http://www.lib.umich.edu/chhome.html>

Described as a 'meta-catalogue' to specialized guides for most subjects which can be found on the Internet. The guides themselves list WWW, gopher and ftp sites. Some guides are hyperlinked, some are plain-text. The plan was to have these guides rated by January 1996. This database of guides is also searchable. Sponsored by the University of Michigan and Argus Associates.

## APPENDIX 2

### KEYWORD SEARCHING TOOLS: SEARCH ENGINES, FORMS-BASED COLLECTIONS OF SEARCH TOOLS, AND MULTI-THREADED SEARCH ENGINES

#### Search Engines

- **Excite**

<http://www.excite.com/>

A multi-purpose site from Architect. Excite offers NetReviews, as well as an index to one million Web documents, the past two weeks of Usenet news and Usenet classified ads. Offers options for searching by concept and keyword and returns a descriptive link.

- **Infoseek**

<http://www.infoseek.com/>

Infoseek offers both a free and subscription-based option. Voted by *PC Computing* magazine's editors as the most valuable search tool for 1995. It allows for phrase searching, which greatly increases the quality of your results.

- **Inktomi**

<http://inktomi.berkeley.edu>

A relative newcomer from the University of California, Inktomi claims to bring a faster and bigger search engine using parallel computing. It is described as a comprehensive search engine without sacrificing speed. Searches can be up to 10 words. Results are ranked for computed relevance and descriptions are brief.

- **Open Text**

<http://opentext.uunet.ca:8080>

Open Text offers full-text indexing with many search options, such as phrase searching, near searching and specific field searching. Retrievals include a relevance score, file sizes, an abstract, and even a link to similar pages. Its new alliance with Yahoo indicates interesting changes.

- **Lycos**

<http://www.lycos.com/>

Lycos' index is huge — it claims to have indexed 91 per cent of the Web. The index searches by document title, links and keywords. It offers many search options and returns a ranked list with options for terse or long display. It is often busy.

- **World Wide Web Worm**

<http://www.mcb.cs.colorado.edu/home/mcbryan/WWWW.html>

Voted Best Navigational Aid of 1994, this index offers powerful search options if you know 'grep'. The Worm allows you to narrow your search to: an URL address, an URL reference, a document title or a document address. Their online helps are often difficult to understand.

- **Webcrawler**

<http://webcrawler.com/>

Webcrawler is fast, relatively easy to use, indexes titles, as well as content, recently absorbed by America Online and returns a ranked list of hits with no descriptions.

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#### Forms-Based Collections of Search Tools

- **All-In-One-Search Page**

<http://www.albany.net/~wcross/allsrch.html>

This page by William Cross at Albany Net is a compilation

of various forms-based search tools found on the Internet. It covers the World Wide Web, general Internet, specialized interest, software, people, news, weather and other resources.

- **CUI W3 Search Engines**

<http://cuiwww.unige.ch/meta-index.html>

This site, from the University of Geneva, collects some of the most useful search engines available on the WWW and allows you to search from this page.

- **CUSI**

<http://web.nexor.co.uk/public/cusi/cusi.html>

CUSI (Configurable Unified Search Interface) is a forms-based search tool which allows you to search many searchable WWW resources, software indexes, people indexes, dictionaries, etc. Offered by Nexor in the U.K.

- **IT!**

<http://www.cam.org/~psarena/it.html>

IT!, which stands for Internet Tools!, is a collection of three convenient meta-resources: Find-It! which lists search engines around the Web; Promote-It!, which lists several ways to get your Web page noticed; and Research-It!, which provides a quick way to research different resources, Web-based or otherwise. Each page provides links to the resources, and in most cases, also supplies forms for them, so you can choose whether to use It!'s pages, or go straight to the source.

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#### Multi-Threaded Search Engines

- **Metacrawler**

<http://metacrawler.cs.washington.edu:8080/>

An excellent search tool that combines results from Lycos, Webcrawler, InfoSeek's trial database, Yahoo, and Einet Galaxy. Result sets specify name, URL, the database in which the resource was found, and any annotations that could be found in the source database. Searches can be limited by locality, region, country, and type of domain (org, com, edu, etc.). Metacrawler was developed by Erik Selberg and Oren Etzioni of the University of Washington.

- **Multi-Threaded Query Page**

<http://www.sun.com/cgi-bin/show?search/mtquery/index.body>

This page, from Sun Microsystems, offers a multi-threaded query gateway. To perform a query, individuals enter the query text, select the search engine(s), and press the submit button. The queries run in parallel and will take as long as the slowest search engine selected.

- **SavvySearch**

<http://www.cs.colostate.edu/~dreiling/smartform.html>

SavvySearch takes Web searching one step further by centralizing your query and sending it to five other search engines to be searched simultaneously. It allows users to specify information categories, such as people, software, reports, reference. Be prepared to wait for your results.

## APPENDIX 3

### SEARCH TOOL COMPARISONS & EVALUATIONS: A WEBLIOGRAPHY

#### Papers and Articles

- Allen, R.B. (1994). *Navigating and searching in hierarchical digital library catalogs: Paper presented at the first annual Conference on the Theory and Practice of Digital Libraries*. [Online]. Available HTTP: <http://atg1.wustl.edu/DL94/paper/allen.html>
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